

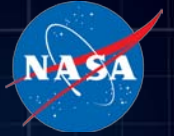
Update on NASA's Commercial Spaceflight Initiatives

NAC Space Operations Subcommittee

February 8, 2010

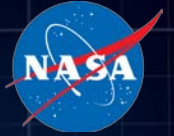
Phil McAlister, NASA HQ



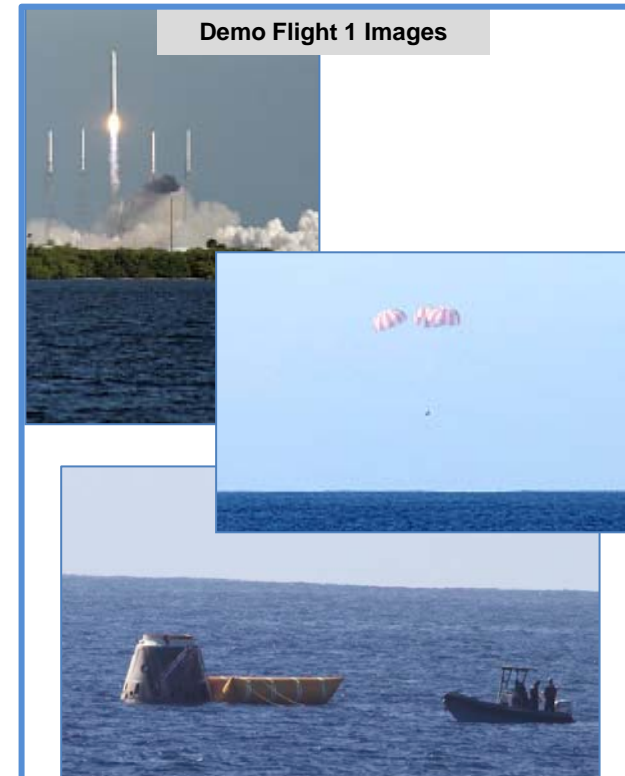


- Commercial Cargo Program – Commercial Orbital Transportation Services (COTS) Status
 - SpaceX
 - Orbital Sciences
- Commercial Crew Program
 - Commercial Crew Development (CCDev)
 - CCDev Round 2
 - CCDev Follow-on

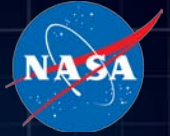
SpaceX Status



- 22 of 26 milestones completed for payments to date of \$278M out of \$298M.
- Demo Flight 1 successfully accomplished on December 8, 2010.
 - Falcon 9 launch and Dragon insertion to orbit
 - Dragon separation
 - Safe reentry
- Demo Flight 2 mission planned for June 2011.
 - Rendezvous and proximity operations with ISS
 - ISS communication demonstration
- Demo Flight 3 mission planned for September 2011.
 - Berthing operations with ISS
 - Cargo transfer demonstration



Orbital Status



- 18 of 22 milestones completed for payments to date of \$177.5M out of \$190M total.
- Cargo Integration Demo, completed at Thales Alenia in Italy Dec 1-3.
- AJ-26 engine hot fired at Stennis Space Center.
- Ground infrastructure at Wallops Flight Facility under construction.
- COTS demo flight planned for October 2011, demonstrating:
 - Launch vehicle operations
 - Cygnus orbital operations
 - ISS proximity and berthing operations
 - ISS departure and destructive re-entry ops



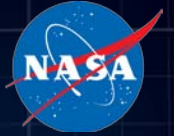
NK-33 1st Stage Engine Testing



Launch Pad Construction at WFF

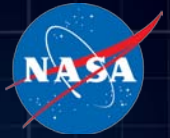


Pressurized Cargo Module

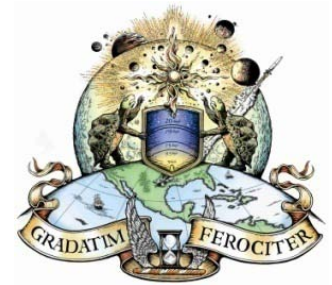


- Both providers are making good progress their development efforts.
- While there have been some schedule slips, the degree of schedule slippage is completely consistent with NASA's historical experience on robotic and new spacecraft missions.
- Both SpaceX and Orbital have a very challenging year ahead. Some anomalies during the test flights would be consistent with historical spacecraft development efforts.
- NASA stands to gain two new launch vehicles, two spacecraft capable of delivering cargo to ISS, and all the associated ground and launch infrastructure for a very modest investment relative to historical experience.

Commercial Crew Development (CCDev)



- The NASA Recovery Act stimulus funding, included \$50M to stimulate efforts within the private sector to develop and demonstrate technologies that enable commercial human spaceflight capabilities.
- On February 1, 2010 five partners were announced and received funding:
 - Blue Origin
 - Boeing
 - Paragon
 - Sierra Nevada Corporation
 - United Launch Alliance (ULA)
- All Agreements were concluded by December 2010, with the exception of ULA and Boeing who received no-cost extensions to April 2011.



CCDev Accomplishments

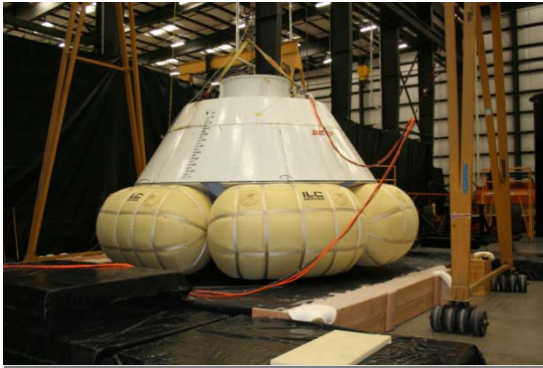
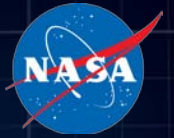


Image: Boeing Air Bag Test Article



Image: SNC Motor Firing

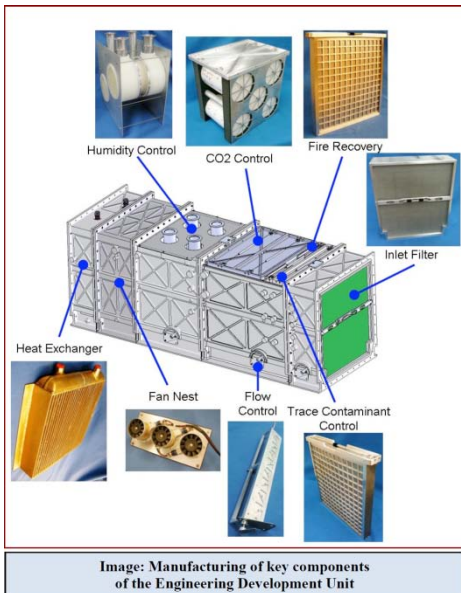


Image: Manufacturing of key components of the Engineering Development Unit

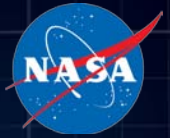


Image: ULA Emergency Detection System Prototype and Test Bed

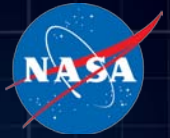


Image: SNC Dream Chaser Pressure Shell

Commercial Crew Development Round 2



- CCDev Round 2 Announcement for Proposals was released to industry on October 25, 2010. Proposals were received on December 13, 2010.
- The goals of CCDev 2 investments are to:
 - Advance orbital commercial CTS concepts
 - Enable significant progress on maturing the design and development of elements of the system, such as launch vehicles and spacecraft
 - Accelerate the availability of U.S. CTS capabilities
- New competition open to all U.S. commercial providers for NASA Space Act Agreements (SAAs).
- Pay-for-Performance milestones, April 2011 to no later than May 2012.
- CCDev 2 awards are planned to coincide with the FY11 appropriation (estimated for March) which will determine the exact amount available. An estimated amount of \$200M was included in the Announcement.
- If a Continuing Resolution is extended beyond the expected award date, NASA may consider reallocating funds from other authorized programs, delay the awards, or not award at all.



Fiscal Year

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

Demo/Test Flights

Design/Development/Certification

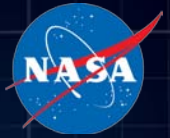


Missions




- The objective of the proposed commercial crew initiative is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from LEO and the International Space Station (ISS).
- Use a non-traditional acquisition and partnering approach.
- Competition is a fundamental aspect of the strategy: incentivizes performance, supports cost-effectiveness, and eliminates NASA dependence on a single provider.
- The 2010 NASA Authorization Act established commercial crew as the primary means for ISS crew transportation.

NASA's Human Rating Requirements Status

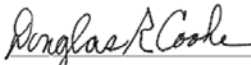


- In May 2010, NASA released to industry the first version of our commercial human rating requirements in a document titled, *Commercial Human Rating Plan* (CHRP).
- NASA received extensive input from industry on the CHRP.
- NASA developed a concept known as “crew transportation system certification”, as opposed to “human rating”.
- On December 9, NASA baselined and released the *Commercial Crew Transportation System Certification Requirements for NASA Low Earth Orbit Missions* document (see right).

National Aeronautics and Space Administration		
		
CCTS Certification Requirements	Document No: ESMD-CCTSCR-12.10	
	Revision: Basic	Effective Date: December 8, 2010

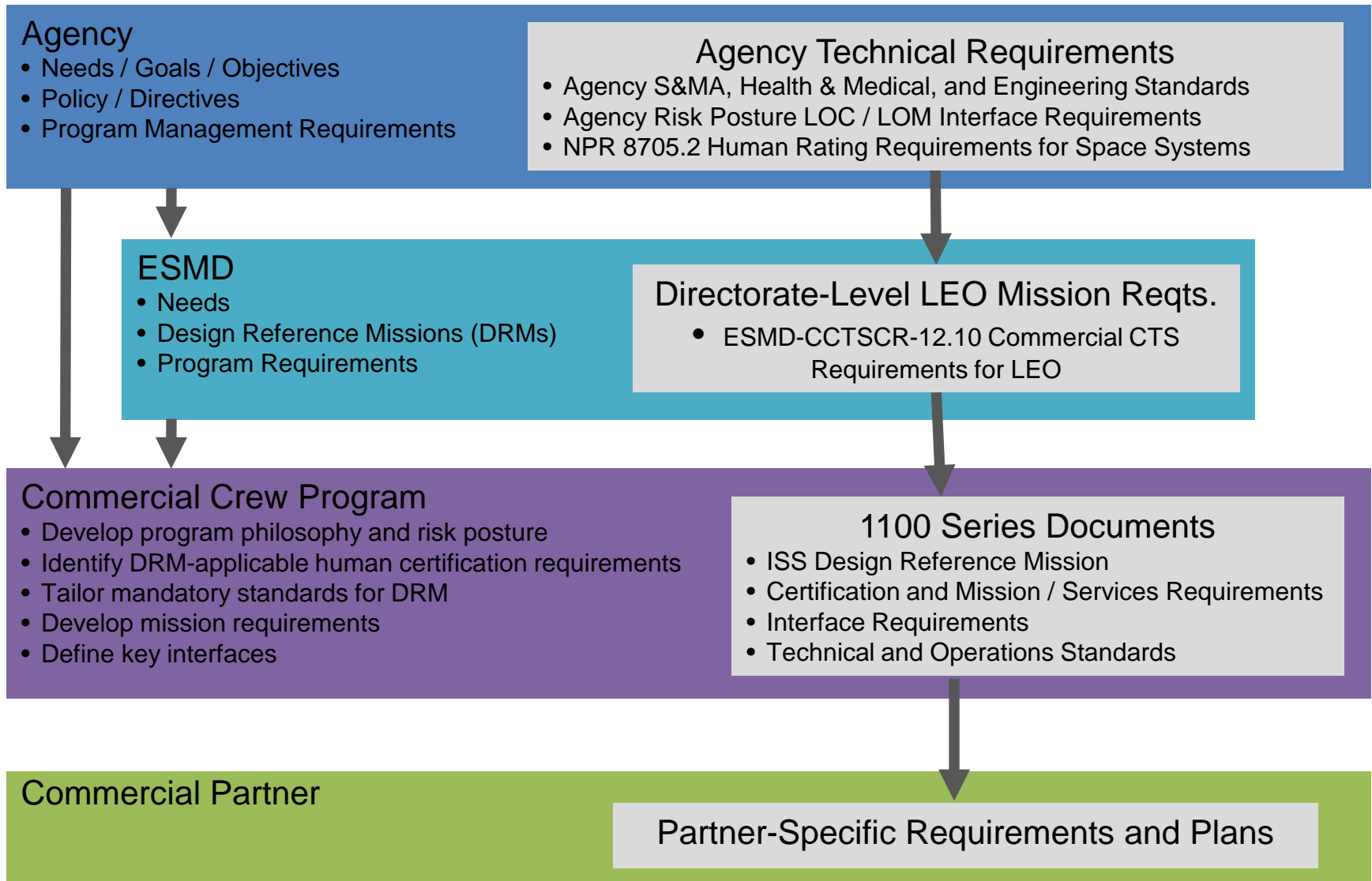
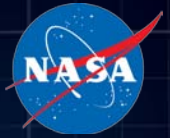
**Commercial Crew Transportation System
Certification Requirements
for
NASA Low Earth Orbit Missions**

ESMD-CCTSCR-12.10
Revision: Basic

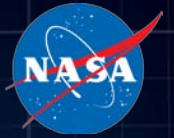

Douglas R. Cooke
Associate Administrator
Exploration Systems Mission
Directorate

12/9/10
Date

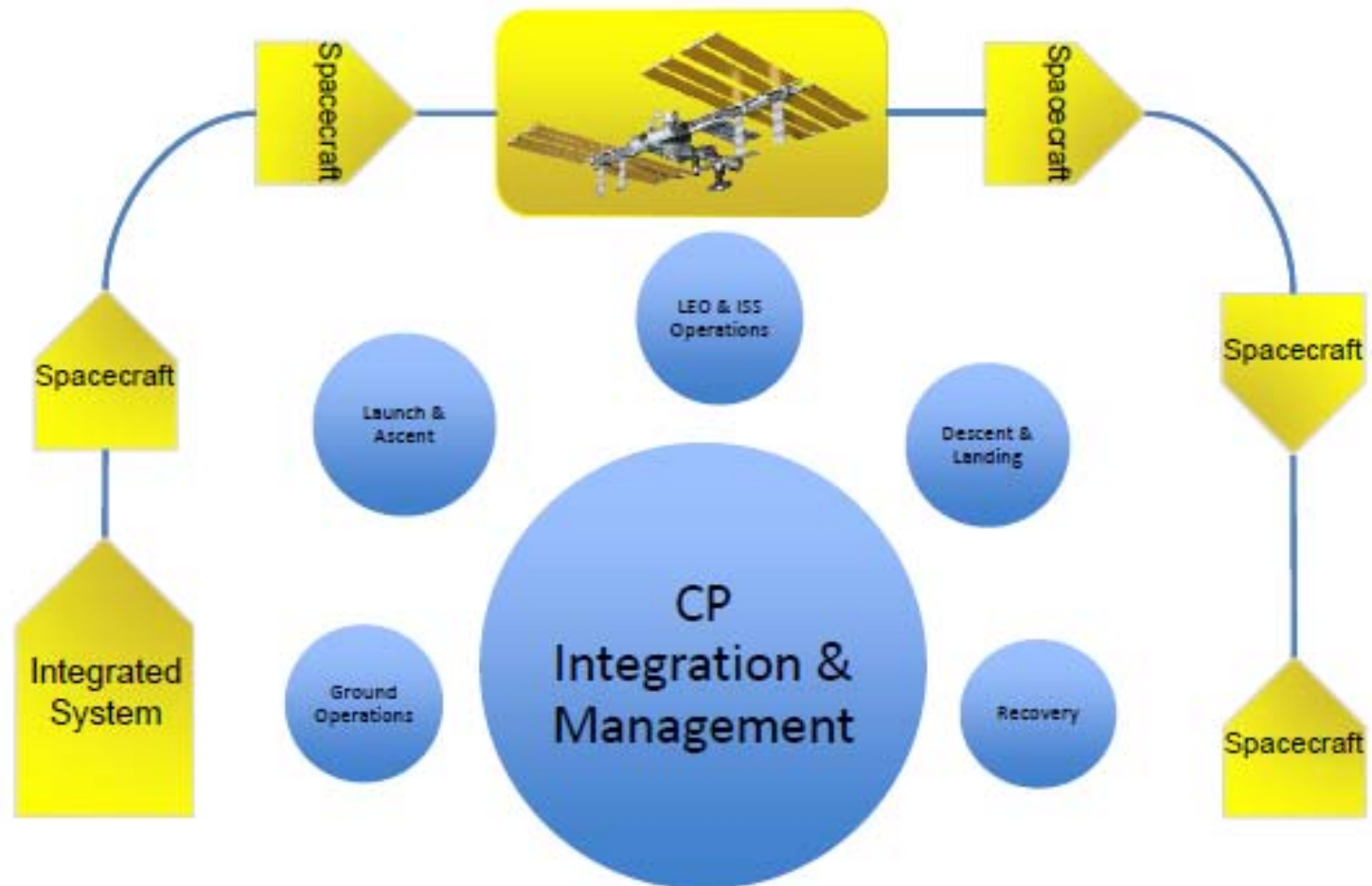
Certification Document Structure



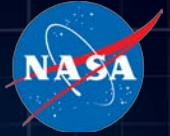
Concept of Operations



- Commercial Partners provide end-to-end integration, including production, processing, launch operations, mission planning, flight operations, crew training, vehicle and crew recovery, vehicle safing, and disposal.

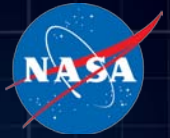


Concept of Operations (cont)



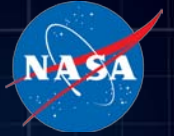
- The conops and requirements are intentionally high-level, thereby providing Commercial Partners (CPs) maximum flexibility to propose innovative and cost effective solutions.
- CPs are responsible for all facilities and infrastructure
 - NASA resources can be made available to CPs, if requested, through reimbursable agreements
 - The Commercial Crew Program does not plan on directly funding facility/capability costs or be the broker on behalf of CPs
 - CPs are encouraged to discuss needs and negotiate facility and capability usage with NASA Centers
- Specific government furnished equipment will be provided on a case-by-case basis.
- CPs will be responsible for providing Certification of Flight Readiness (CoFR) for the vehicle and all ground and flight support infrastructure to NASA for acceptance.

Benefits of a Successful Commercial Crew Program



- After the Shuttle is retired later this year, only Russia and China will have the capability of getting people off the planet.
- As the primary means for the U.S. to launch crew to low-Earth orbit, the Commercial Crew Program will:
 - End the gap in U.S. human access to space
 - Give us assured access to the International Space Station
 - Strengthen America's leadership in space
 - Allow NASA to focus on exploration, enabling us to go further, faster
 - Contribute to the national economy
- By pushing the boundaries of private enterprise and commerce into low-Earth orbit, we will have planted the first truly sustainable flagpole in our expansion into space.
- There will be no turning back once commercial spaceflight to low-Earth orbit is a robust, vibrant, profit-making commercial enterprise with many providers and a wide range of private and public users.

Commercial Crew Summary



- CCDev 1 is essentially complete.
- CCDev 2 evaluations are underway. CCDev 2 will allow NASA and industry to make significant progress towards maturing commercial crew designs and system concepts.
- NASA is simultaneously planning for the follow-on Commercial Crew Program.
- NASA is attempting to define and implement a new way of doing human space transportation. Many challenges will need to be addressed. Strong support from all stakeholders is critical to success.